The Effect of Mycorrhiza and P Fertilizer on the Yield of Wheat Varieties Dewata 162

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ABSTRACT

Research on the effect of mycorrhizae and P fertilizer on wheat crop yields has been conducted from May 24 to September 5, 2021, in Gejagan Village, Pakis District, Magelang Regency, at an altitude of 760 m above sea level. The research method used a factorial experiment (4 x 3) arranged in a Completely Randomized Block Design (RAKL) with two treatment factors and repeated four times. The first factor was the mycorrhizal dose, namely 0 g/plant, 2.5 g/plant, 5 g/plant, and 7.5 g/plant. The second factor is the dose of P fertilizer, namely 25%, 50%, and 75%. The means of variance showed the data analysis. The influential results were further evaluated using Orthogonal Polynomials. The results showed that the application of mycorrhizae and P fertilizer had no effect on all observed variables, namely plant height, number of tillers per clump, number of productive tillers per clump, panicle length, number of seeds per panicle, dry seed weight per panicle, dry seed weight per m², and weight of 1000 dry seeds. There was no interaction between mycorrhizal dose treatment and P fertilizer dose on all observation parameters

Keywords: *Wheat, Phosphorus, Mycorrhizae*

INTRODUCTION

In Indonesia, wheat is the second staple food after rice. Wheat is one of the alternative food ingredients in supporting food security and food diversification. This causes wheat consumption to continue to increase in line with the growing public interest in consuming processed foods made from wheat flour (Sumarno and Mejaya, 2016). Based on data from the Central Statistics Agency in 2019, wheat imports in Indonesia amounted to 10,096,299 tons. This is due to the increasing population and consumption patterns. In Indonesia, wheat production and crop cultivation are still very small, so it has not been able to meet the needs of the community. This is due to the low interest of farmers in wheat cultivation, low knowledge of farmers and less than optimal in wheat cultivation, one of which is the use of chemical fertilizers. Excessive use of chemical fertilizers has a negative effect on the environment, including physical, chemical, biological soil damage and groundwater pollution (Kartika et al., 2017).

The solution to reduce the use of chemical fertilizers is to apply mycorrhizae. Mycorrhizae are a type of fungus that live in symbiosis with plant roots. This fungus helps the absorption of water and nutrients, increases plant resistance to drought, as protection from pathogens and toxic elements, produces compounds growth stimulant, stimulates the activity of several beneficial organisms, improves soil structure and aggregation, helps mineral cycles and increases plant growth and yield (Basri, 2018).

The aims of this study were (1) to determine the effect of mycorrhizae on the yield of wheat (Triticum aestivum, L.) Dewata 162 variety, (2) to determine the effect of P fertilizer on the yield of wheat (*Triticum aestivum, L.*) varieties Dewata 162, (3) Knowing the interaction of mycorrhizal species with P fertilizer on the yield of wheat (*Triticum aestivum, L.*) Dewata 162 varieties.

MATERIAL AND METHODS

The research was conducted from May 24th to September 5th, 2021, in Gejagan Village, Pakis District, Magelang Regency with an altitude of 760 m above sea level and andosol soil type.

The tools used include hoe, *tugal*, sprayer, *gembor*, bucket, sickle/ani-ani, meter, analytical scale, label, stationery, and grain analyzer. The materials used were wheat germ varieties Dewata 162, mycorrhizae, SP36, urea, KCL, furadan 3G, lannate, and antracol.

The research was conducted on land using a factorial experiment (4x3) arranged in a Randomized Complete Block Design (RCBD). The study consisted of two treatment factors and was repeated four times as blocks. These factors are: (1) Mycorrhizal (M) dose, consisting of:
M1: 0 g/tan M2: 2.5 g/tan M3: 5 g/tan M4: 7.5 g/tan (2) The dose of fertilizer (P) is 60 kg/ha, consisting of: P1: 25% P2: 50% P3: 75%, so that obtained 12 treatment combinations, namely: M1P1, M2P1, M3P1, M4P1, M1P2, M2P2, M3P2, M4P2, M1P3, M2P3, M3P3, M4P3.
Analyzing of observational data was using a variance fingerprint. Further tests for both treatments if the results are significantly different use BNT for the first factor and Orthogonal Polynomial for the second factor.

The research stages include are: (1) Land Preparation, (2) Seed Selection (3) Planting, (4) Maintenance including Irrigation, Fertilization, Weeding, Embroidery, and Pest Disease Control. (5) Harvest

RESULT

Observational data were analyzed using variance, based on this analysis, the results of the F-count of the observation parameters were found in table 1.

Table 1 shows that the mycorrhizal dose and the P fertilizer dose had no significant effect on plant height, number of tillers per clump, number of productive tillers per clump, panicle length, number of seeds per panicle, dry seed weight per panicle,
dry seed weight per m², and 1000 dry seed weight. There was no interaction between mycorrhizal dose treatment and P fertilizer dose on all observation parameters.

Table 1. F-count observation variables

Observation variable	Treatment		
	M	P	MxP
Plant height (cm)	01,700^{tn}	0,586^{tn}	1,533^{tn}
Number of tillers per clump (tillers)	0,461^{tn}	2,886^{tn}	0,669^{tn}
Number of productive tillers per clump (tillers)	0,102^{tn}	1,180^{tn}	0,741^{tn}
Panicle length (cm)	1,021^{tn}	0,608^{tn}	1,141^{tn}
Number of seeds per panicle (seeds)	0,378^{tn}	0,898^{tn}	0,422^{tn}
Dry seed weight per panicle (g)	0,076^{tn}	0,492^{tn}	0,860^{tn}
Dry weight per m² (g)	0,158^{tn}	0,783^{tn}	0,484^{tn}
Weight of 1000 dry seed (g)	0,771^{tn}	2,636^{tn}	1,841^{tn}

Description: M: Mycorrhizae, P: Fertilizer P, tn: Not significantly different

Effect of Mycorrhizae on Wheat Crop Yield

The results of the analysis showed that the treatment of mycorrhizal doses with 4 levels, namely 0 g/plant, 2.5 g/plant, 5 g/plant and 7.5 g/plant had no effect on plant height, number of tillers per clump, number of productive tillers per clump. , panicle length, number of seeds per panicle, dry seed weight per panicle, dry seed weight per m², and 1000 dry seed weight. This is presumably because

mycorrhizae do not have an optimal symbiosis with roots so that the growth and yield of wheat plants does not affect. The non-optimal role of mycorrhizae causes inhibited panicle growth. Short panicles can affect the number of seeds per panicle, and seed weight per panicle. According to Lakitan (2012), mycorrhizal fungi can infect plant roots by forming hyphae internally in the cortex tissue, then the hyphae extend out from the roots (external hyphae) and assist the roots in absorbing water and nutrients.

The variable number of tillers will affect the number of productive tillers, the more productive tillers produced, the more seeds and weight will be produced. Mycorrhizae had no significant effect on all observed variables. This is presumably because the activity of mycorrhizae is hampered by factors from the land. According to Muis (2013), the development of inoculated mycorrhizae cannot be max due to non-optimal environmental influences. Environmental factors in question include temperature, water content, soil pH, light, organic matter, and fungicides. This resulted in mycorrhizae not being optimal in infecting the roots of the host plant and in helping the absorption of P. Milla (2016), argues that the right time of mycorrhizal administration will affect the inoculation process and the function of mycorrhizae. So, the time of putting mycorrhizae should be ± 14 days before planting. Giving mycorrhizae in the study was 7 days after planting. This is thought to result in less optimal mycorrhizae in absorbing water and nutrients so that the provision of mycorrhizae did not significantly affect all variables.

Effect of P Fertilizer on Wheat Crop Yield

The results of the analysis showed that the treatment dose of P fertilizer with 3 levels, namely 25%, 50%, and 75% had no effect on plant height, number of tillers per clump, number of productive tillers per clump, panicle length, number of seeds per panicle, dry seed weight per clump. panicle, dry seed weight per m^2, and 1000 dry seed weight. Nutrient P is one of the macro nutrients that can help in the process of seed formation in plants. P nutrients in cereal crops can increase seed filling and stimulate flowering (Widyastuti and Suminarti, 2018). The number of seeds each panicle will affect the weight of seeds per panicle produced, the more seeds, the higher the weight produced. The results of this wheat plant research are not optimal.

Based on the description of the Dewarta variety wheat plant, 162 seeds per panicle produced ± 47 grains, while the results of the study were less than the description, namely 34 grains. The weight of 1,000 seeds in the description is ± 46 g while the results of the study are 34 g. P absorption is ineffective suspectedly, due to the nature of P nutrients which are easily soluble in water, so that it can affect the weight of the wheat grain produced. According to Faveretto et al, (2012), the nutrient leaching process is specific which is strongly influenced by the physical and chemical properties of the soil, the type of fertilizer and its solubility, rainfall, plant factors, soil and water conservation measures, and various other agro-climatic factors. One of the possible factors is high rainfall so that P nutrients are easily soluble by water.

The number of tillers and the number of productive tillers produced is a small amount of this presumably due to nutrient needs are not fulfilled properly. The land used in this study was wasteland for agricultural cultivation for a long time. So that the nutrient content available on the land is small. According to Puspitawati et al (2013), nutrient P plays a role in the

formation of tillers that produce panicles or productive tillers.

Interaction between Mycorrhizae and P Fertilizer on Wheat Yield

The results of the analysis showed that mycorrhizae had no effect on all observed variables, namely plant height, number of tillers per clump, number of productive tillers per clump, panicle length, number of seeds per panicle, dry seed weight per panicle, dry seed weight per m², and 1000 seed weight. dry. There was no interaction between mycorrhizal and P fertilizer treatment, mycorrhizae did not have optimal root symbiosis and pest and disease attacks on wheat. Pests that attack wheat are planthoppers (*Nilaparvata lugens*), caterpillars (*Agrotis ipsilon*), grasshoppers (*Cailifera*) and green ladybugs (*Nezara viridula*). These pests attack the leaves, stems and seeds of wheat plants thereby reducing the number of tillers, the number of productive tillers and the weight of wheat seeds. Diseases that attack wheat are leaf rust (*Puccinta recondite*), scab disease, carnal bunt disease (*Tilletia syn. neoussia indica*) and Barley Yellow Dwarf. This disease causes the leaves on wheat plants to turn yellow and panicles are moldy so that the yield of wheat plants is less than optimal.

CONCLUSION

Based on the research that has been done, it can be concluded that Mycorrhizae and dose of P fertilizer had no effect on plant height, number of tillers per clump, number of productive tillers per cluster, panicle length, number of panicle seeds, dry seed weight per panicle, dry seed weight per m² and 1000 dry seed weight. Furthermore, there was no interaction between the effect of mycorrhizal and P fertilizer on the yield of the Dewata 162 wheat crop. Further research needs to discuss on the use of mycorrhizae in wheat plants.

ACKNOWLEDGEMENT

We thank to our colleagues from Universitas Tidar who provided insight and expertise that assisted the research.

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